REVISIONAL NOTES ON THE DANAINÆ (SUPPLEMENT)

By Wm. T. M. Forbes

A few years ago I published a block of revisional notes on the Lepidopterous subfamily Danainæ (the milkweed butterflies). Since then there has been considerable activity in the group and some additions, comments and corrections are in order. First, attention should be called to the following important publications: d'Almeida, Revisião das especies americanas da superfamilia Danaoidea. . . . Danainæ; in Memorias do Instituto Oswaldo Cruz, xxxiv, 1–113, pls. 1–30, 1939; an account of the migrations of the Monarch by Williams and others in Trans. Roy. Ent. Soc., xcii, 147–148, 155–184, 1942; and papers by Talbot on *Amauris* in Trans. Roy. Ent. Soc., xc, 319–336 (with a key), *Ideopsis* in Proc. Roy. Ent. Soc. (B), ix, 197–202; *Idea* (*i.e. Hestia*) in Trans. Roy Ent. Soc., xci, 105–117, with key; and a few notes on species of *Euplœa* by Carpenter in Proc. Roy. Ent. Soc. (B), xi, 1942; also notes and three new names by Clark in Proc. U. S. Nat. Mus., xc, 531–542, 1941.

GENITALIC CHARACTERS

D'Almeida has made a substantial first start toward the presentation of the genitalic characters of the Danaids, with figures of all but one of the American true species, and representative old-world ones. We should first make three or four notes on nomenclature. Firstly as Hemming has noted, our current use of the name *Anosia* for the monarch, as based on Moore's selection of *plexippus* as the type, is invalid, for Scudder had already chosen *gilippus* in 1875; and *Tasitia* with *gilippus* as type is a strict synonym. To clear the mess d'Almeida proposes *Diogas* for the Monarch, citing *erippus* as type. I have already noted my feeling that these are hardly even subgenera, and we duly find the genitalia of *chrysippus* (d'Almeida, Pl. 7, Figs. 1, 4, 5) almost identical with *eresimus,*

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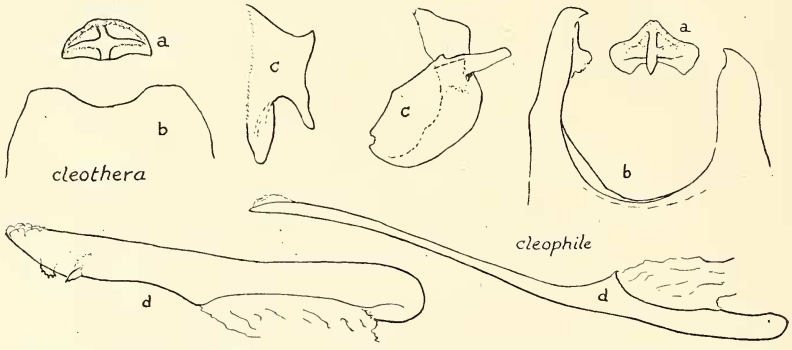
even to the two little flanges on the ædœagus. *D. genutia* (*plexippus*) is more distinct, with the proper type of valve and ædœagus, but the angular last sternite of *Diogas*. There are a couple of misdeterminations in d'Almeida. His *eresimus cleothera* is the new Central American race described below, while true *cleothera* is a *gilippus*-race from Haiti, near *hermippus* (his Pl. 18, Fig. 4). I have examined the genitalia (figure, left) and they confirm this. His *eresimus* also, is my recent race *dilucida*.

There are two striking differences between *eresimus* and *gilippus:* in *eresimus* the ædœagus has two thin toothed flanges



Male genitalia of *Danaus,* showing: a, juxta, b, last sternite, c, valve, d, ædœagus. Left *D. cleothera,* right *D. cleophile.*

near the apex, and the last sternite is barely emarginate; in *gilippus* there are only two groups of 2 or 3 small teeth on the ædœagus, and the last sternite is deeply divided. As is to be expected, *plexaure* shows no noticeable difference from *eresimus.*

D. cleophile, which d'Almeida lacked, turns out to be close to *erippus,* rather than *gilippus* (figure, right) in the single terminal spike on the valve, slender, simple ædœagus and strongly toothed last sternite. Here pattern proves a better guide than venation! By the way, genitalia in this group are difficult to mount symmetrically. I found the nearest approach to success by removing only the juxta, and then flattening the residue a little laterally.

A further interesting point is that so far as studied all the genera of Danainæ with *paronychium* and *pulvillus* have also preserved the clasper, while *Danaus,* which has simple naked claws, has lost it.

Idea (*Hestia*)

Talbot still groups *hypermnestra* with the *idea* group in spite of the divergent pattern and unstable venation.

Danaus megalippe portoricensis

This was described by Clark on the basis of only two specimens. Cornell has a good block of 16, which gives a much better idea of the subspecies. As is so frequent with races, none of the characters prove quite stable: the length of fore wing averages 3 mm. less than in *megalippe,* but only two specimens are small enough to be abnormal for the other races (see graph). On the other hand North American *menippe* are substantially larger.[1] The best character proves to be the lack of the white spots at end of cell, as only two specimens have them well developed above. The absence of white spots in the border of hind wing holds up fairly well, with no males and only half the females showing as many white spots as average *megalippe,* but the subapical spots fail entirely.

In striking contrast to this block from Porto Rico, the three females I saved from Vieques Id. are all of the *leucogyne* type, with dull coloring, and the white spotting as strong as in *megalippe.* Their expanse (46.7 mm. average) is normal for *megalippe,* but within the range of *portoricensis.*

Danaus candidus Clark

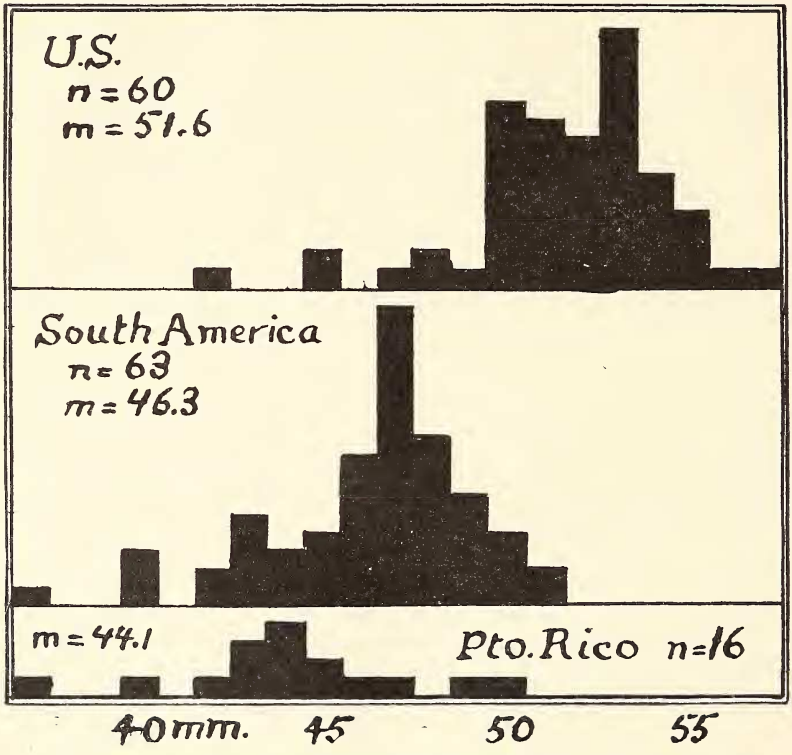
This is the form I mentioned (p. 135, ftn. 19) from Cuzco. We now have a second pair from Rio Piene, Apurimac, Peru,[2] and it certainly deserves racial status, but I still believe it belongs to *gilippus.*

[1] In making the graph I have grouped all specimens except *menippe, portoricensis* and *leucogyne.* They showed no sign of local variation in size, even the Mexico-Venezuela specimens with tawny subapical spots being no larger.

[2] The gift of Mr. Frank Johnson.

THE NORTHERN RACES OF *D. ERESIMUS*

In my former paper I made no attempt to subdivide the northern population of *eresimus,* since I had only a few specimens at hand. It now seems best to define the leading races, especially as one of them has been generally reported and figured by mistake for *cleothera* and recently by both d'Almeida



Danaus megalippe (Monarch). Length of fore wing.

	n.	Mean	S.D.	S.E.
menippe (U. S.)	60	51.6	2.6	.34
megalippe & *erippus* (S. Am.)	63	46.3	2.9	.36
portoricensis (P. R.)	16	44.1	3.0	.78

(see above) and Clark (l.c., p. 539, Pl. 74, Figs. 3, 4). Taking Surinam, Mexico and Hispaniola for the type localities of three races, they are well contrasted, though the blend zone is embar-

rassingly large, covering Cuba and the whole area from Panama, except perhaps the extreme west, to the upper Amazon. The following key will define the races, but applies only to typical populations:

1. Border of hind wing below only slightly darker brown than ground and shading into it, or if black ill defined and not fully enclosing the inner row of white dots 2
–. Border of hind wing below solid black, sharply defined and enclosing both rows of white dots 4
2. Wings above heavily shaded with black between the two series of spots and along the border, at least; hind wing below warmly colored, tawny to red-brown 3
–. Wings above with black shading confined to extreme margin and costa; hind wing above with outer part noticeably lighter tawny, below leather brown without orange or red tint; white markings conspicuous, sometimes with the subterminal and terminal dots on fore wing partly fused (Amazons) ..... *dilucida*
3. Hind wing with subterminal as well as terminal dots conspicuous, apex of fore wing more black, hind wing more tawny (West Peru and Ecuador) ..... *erginus*
–. H. w. with st. dots largely lost, terminal series sometimes incomplete; ground usually even brown, with less black in apical area (Guiana). *eresimus*
4. Pm. paler patches on hind wing below even-colored, the ones at end of cell small; f. w. with pale or white pm. spots in cells M_3, Cu_1 and sometimes Cu_2 (Antilles) ..... *tethys*
–. Pm. patches on hind wing below scaled conspicuously with white along the veins, sometimes reduced to their white edges, the spots at end of cell similar and often large; no pm. spots on fore wing below vein M_3 (Central America) ..... *montezuma*

Danaus eresimus montezuma Talbot

Similar to *D. e. eresimus*, except as follows: Ground a little duller (the major part of hind wing and lower angle tawny,—Ridgway 13′i in *nephele*, ochraceous tawny or a shade brighter than that,—Ridgway 15′i in *e. eresimus*), postmedial white spots on the average smaller, the one in cell M_1 generally less than 2 mm. wide, and those below M_3 absent or the first one vestigial; black border wider, running about 5 mm. wide over M_3–Cu_2 of hind wing (3 mm. as a rule in *e. eresimus*), the two series of marginal white spots further apart. Under side of fore wing much as above, the pm. spot in cell M_3 often visible as a white or buff point, never as a tawny patch; black shading commonly ending abruptly near vein M_3, cell M_2 being postmedially brown-black and M_3 chestnut, shading into the tawny ground, as a rule; area before anal angle not noticeably brighter. Hind wing distinctive, with the pm. spots normally large, reaching from vein to vein and more or less dis-

tinctly edged along the veins with white scaling, sometimes fading out and only leaving the white scaling; also always with distinct similar spots around end of cell in cells R, M_1 and M_2, sometimes small and close to cell, more often nearly as large as the pm. spots and reaching out almost to them, or even partly fusing with them; veins around cell also edged with white. Ground darkened, as a rule contrastingly, between the two rows of patches, and cell Sc also with a corresponding dark bar, or more rarely patch, crossing it opposite end of cell. Border as above, but with both series of white marginal spots conspicuous.

Variation is moderate north of Panama, consisting mainly in the development of the spots around the cell, and the strength and extent of the brown shading on under side of hind wing. This is the form figured by d'Almeida and A. H. Clark as *cleothera* (Mem. Inst. Oswaldo Cruz, xxxiv, 34, Pl. 3, Figs. 1, 6, 15, Fig. 5, 16, Fig. 4; Proc. U. S. N. M., xc, Pl. 74, Figs. 3, 4). It differs from *cleothera* in genitalia and under side pattern, as well as locality, but resembles it in lacking the pm. spots below M_3 as mentioned by Hall in his description of the synonym *D. kaempfferi*. Curiously d'Almeida has made the reverse slip in his placing of *kaempfferi*, which he lists as a race of *eresimus*.

Texas to Panama, in Panama mixed with specimens similar to the Antillean race. Male from La Encarnacion, Pital, Campeche, Mexico, 10/11/33, John T. Martin, in Cornell University Collection.

TEXAS: Medina R. near Castroville, Medina Co., Oct. 30, 1938 (Neumann) (figured by Clark), Brownsville, Nov. 17, 1933 (Armstrong), both males in U. S. National Museum.

MEXICO: Sinaloa, 1 ♂, 2 ♀ (Reading Mus.), Victoria, Tamaulipas, June, 1930, 1 ♀ with some white shading on hind wing (Academy of Natural Sciences, Philadelphia); Jalisco (American Museum of Natural History) 1 ♂ from Johnson; Colima, 1 ♂ (R.M.), Temixco, Guerrero, Oct.–Nov. 1928, 4 ♂ (Th. W. Bouchell) (A.N.S.P.); Acapulco (A. Agassiz) 1 ♀ (Museum of Comparative Zoology), Acapulco Bay, Nov. 25–29, 1937 (A.M.N.H.), Cuernavaca, 1 ♂ with heavy white shading about end of cell of hind wing above (A.M.N.H.); Cordoba, V. C., 1 ♂ with more limited white shading (A.M.N.H.); Jalapa, 3 ♂, 3 ♀ from Schaus coll. in U.S.N.M. and Edwards coll. at A.M.N.H.; Coatepec 1 ♂ (Schaus coll. at U.S.N.M.); Tacuapan, June 1908 (U.S.N.M.); La Encarnacion, Campeche, 4 ♂, 2 ♀ John T. Martin (received from Wards Nat. Sci. Establishment and mainly in Cornell).

Guatemala: Gualan, Jan. 20, 1906, 1 ♂, Los Amalis, Nov. 2, 1905, 1 ♂, Puerto Barrios, Feb. 25, 1905, 1 ♀, all Chas. C. Deam (U.S.N.M.); Cayuga, Schaus (U.S.N.M.), Florencia, Motagua River, July 1, 1930, 1 ♂ (A.N.S.P.), R. C. Williams Lot 82, 1 ♀ (A.N.S.P.), and a ♂ in the National Museum without specific locality.

San Salvador: Gotera, 1 ♀ (R.M.)

Honduras: San Pedro, 3 ♂, 2 ♀ (R.M.), La Ceiba, July 4, 1915 (U.S.N.M.), La Libertad, Comayagua, 2500 ft., June 28, 1933, J. B. Edwards 1 ♂ (M.C.Z.), Las Limas, May 15, do., ♀, Cantarranas, Rio Choluteca, 2200 ft. Aug. 2, 1930 (A.N.S.P.); without further data 3 ♂ in U.S.N.M., 1 ♂ in A.M.N.H. In one of the males from San Pedro and one without data the white along the veins below is very weak, though the patches still extend solidly from vein to vein, and the ground above is a little brighter.

Nicaragua: N. side of Cosiguina volcano, Gulf of Fonseca, Dec. 23, 1939, Zaca Exped., 1 ♂ (A.M.N.H.), without locality, Mr. Niel, one very old specimen in M.C.Z. with white scaling much reduced.

Costa Rica: San Mateo, Dec. 1906, Schaus, 1 ♂ (U.S.N.M.), Tuis, July, Schaus & Barnes, 1 ♂ with heavy white shading on disc of hind wing above (U.S.N.M.), Port Limon, 1 ♂ with white scaling on veins below weak (U.S.N.M. from Owen coll.); Banana River, May 1907, Schaus, 1 ♀ (U.S.N.M.).

Panama: Changuinola District, Bocas del Toro, April 25, 1924, J. C. Bradley, 1 ♂ (C.U.). This specimen nearly lacks the white scaling on the veins, but is very dark, with small subapical spots and none below M_3. Material from the Canal Zone area definitely belongs to the blend zone (see below).

Danaus eresimus tethys new race

Intermediate in most particulars between *D. e. montezuma* and *e. eresimus*. Upper side even brighter tawny than typical eresimus, much of the outer part of hind wing and lower half of fore wing being mars yellow of Ridgway (15i); under side of hind wing tawny olive (17″i). Border of wings intermediate, averaging 4 mm. wide, on hind wing below only just enclosing the inner white dots, and often emarginate between the two dots of each cell; which are closer to margin than in nephele; black shading postmedially on fore wing, in all but two specimens with cell M_2 pretty solidly brown-black,

but usually with M_3 of the ground color; pm. spots large, the one in cell M_1 normally over 2 mm. wide, and with large spots below M_3, most typically with a white one in cell M_3, a light tawny one in Cu_1, and a faint one on upper side only in Cu_2. Hind wing below with ground evenly colored, the pm. spots sharply defined, but without paler bordering, moderate-sized, being shorter than the distance between two veins; spots about end of cell similar but small and faint, or even absent. Veins with accompanying black scaling on membrane each side but narrowly and evenly, much less contrasting than in *e. montezuma*.

This race should perhaps not be separated from *e. eresimus*, the principal difference being the stronger black border on hind wing below, and even this appears in the blend-zone of N. W. South America, but it is locally quite constant on Hispaniola. Jamaica specimens are generally similar, but a higher percentage show the ground color postmedially on cells M_1 and M_2, and one out of ten has lost the lower pm. spots, so that it has the exact fore wing pattern of *montezuma*, (the ground color and under side of hind wing are still normal for *tethys*); a single specimen from the Bahamas shows the lightest apical area (mars yellow, like the lower part of border) and the pm. area is somewhat lightened, but this may or may not mark a slight subrace there.

Greater Antilles, except Porto Rico, in Cuba transitional to nephele. Holotype ♂ from Fond Parisien, Haiti, Feb. 11–18, 1922, F4634, alt. about 60 ft., in America Museum of Natural History. Paratypes:

HISPANIOLA: *Haiti:* same data as holotype, 10 ♂, 2 ♀, (A.M.N.H. and partly distributed); Pont Beudet, Mar. 3–4, 1922, 1 ♂ (A.M.N.H.), Trouin, 4/3/35, 1 ♀, Port de Paix, Mar. 28, 1917, W. W. Abbot, 1 ♂ (A.N.S.P.), Port au Prince, July, 1 ♀ (M.C.Z.), Cul de Sac Plain, Dec. 14, 1927, G. N. Wolcott, 1 ♂ (A.M.N.H.), without further data, Uhler, 3 ♂ (M.C.Z.); *S. Domingo:* Monte Cristi, Atwater, 2 ♀, one dated July 1, 1932 (U.S.N.M.); Rio Yaque, 10 mi. south of Monte Cristi, Feb. 20, 21, 1930, A. L. Sullman, 2 ♂, (A.M.N.H.), Barahona, July 6–11, 1932, W. M. Bush, 1 ♂ (A.M.N.H.), Monserrat, July 12, 20–22, 1932, W. M. Bush, 1 ♂, 2 ♀ (A.M.N.H.), Passe à Roche, July 9, 1935, 1 ♂ (A.M.N.H.).

JAMAICA: near Duncans, June, L. Perkins, 3 ♂, 2 ♀, three of them also marked "Stewart Castle" (M.C.Z.), without further data, 2 in U.S.N.M., 3 in A.N.S.P. Avinoff also took it, and I have seen the specimens at the Carnegie Museum.

BAHAMAS: Nassau, N.P., 11/10/1940 (A.N.S.P.).

BLEND-ZONES, CUBA

Cuba shows every possible combination of Central American and Haitian characters, in such form as to suggest a recent fusion of previously well-separated populations. Out of 17 specimens two males in the M.C.Z. (Soledad, Sta. Clara, Aug. 4, 1932, and Sierra Maestra, 1000 ft., July 4, 1930) show what the true endemic Cuban race should have been before it was swamped from both sides: ground above deep Indian red and even, exactly like *D. g. berenice,* pm. spots white, without tawny tint, black border broadish and black shading beyond cell not strong, nearly lost in the general dark ground; hind wing below dark with the spots strongly contrasting, but not much darkened between the rows of spots, spots at end of cell small but conspicuous, no dark bar across cell Sc; edging of veins as broad as in nephele, but not contrasting with the dark ground, the pm. row of spots distinctly edged with whitish. This is evidently a derivative of the mainland stock, as shown by the broad vein-lines and whitish edged spots, but strongly modified by mimicry of the very dark local *berenice* population. The rest run—ground like *montezuma, tethys* or intermediate; blackish beyond cell present, absent or intermediate; lower pm. spots present in 8, absent in 6, a single small white spot in 1; on hind wing below, cell Sc with bar across it in 2, suffused with brown in 5, ground evenly light in the residue; patches at end of cell large and scaled with white in the two that have a brown bar, small but strongly contrasting in the five with brown cell Sc, with little or no white in the residue, a few of which closely matched tethys. Black veins as in *montezuma* or *tethys.* There is no trace of typical *eresimus.*

PANAMA TO THE AMAZONS

As already noted, the Antillean race is almost exactly intermediate in characters between *montezuma* and *eresimus,* with the result that transitional specimens between the two latter are apt to match Antillean ones. It is not clear if this is the point of origin of the Antillean race, but as such specimens are not found in the part of Central America nearest the Antilles, and are rare in Cuba on the other side, I suspect the two populations are distinct.

Panama. Our only specimen from western Panama is typical *montezuma,* but in the Canal Zone region there is a blend population. Of our ten specimens four have the postmedial spots below M_3 as in *eresimus* and *tethys,* four lack them as in *montezuma,* and two have a single faint spot. On the under side pattern the four with *eresimus* pm. spots all show the *eresimus* under side pattern, the black border being always distinct but never sharply bounded, and there is always some tawny between the two rows of white spots, which are close together. On the other hand three of the remaining six show white scaling along the veins as in *montezuma,* but none have the brown bar across cell Sc.

Colombia. Three specimens from Rio Aguacatal, Western Cordillera, and Villavicenzio and two without further data are like *eresimus,* except for somewhat more black in the border below.

Venezuela. A block of males are almost typical *eresimus,* one specimen only having the black border beneath much too strong.

Upper Amazons. A pair from Teffé have the black border rather stronger than in typical *eresimus.* The apical half of fore wing is very rich deep brown, with the white spots large and contrasting, suggesting a possible first step toward *erginus,* but the border of hind wing above is normal. In the Colombia, Amazon and Guiana specimens as a whole, both the pm. spots are generally white, unlike the majority of Antillean, Panama and Venezuela specimens.